

WHAT IS CLAIMED IS:

- 1 1. A field portable mass spectrometer system comprising:
- 2 a) an aerosol interface;
- 3 b) a sample transporter, the sample transporter interfacing with the sample collector
- 4 to receive sample deposits thereon;
- 5 c) a time of flight (TOF) mass spectrometer, the time of flight mass spectrometer
- 6 having a sealable opening that receives the sample transported via the sample transporter in an
- 7 extraction region of the mass spectrometer; and
- 8 d) a control unit that processes a time series output by the mass spectrometer for a
- 9 received sample and identifies one or more agents contained in the sample.
- 1 2. The field portable mass spectrometer system of Claim 1, wherein the aerosol
- 2 interface comprises an inlet having a vacuum therein, the inlet collecting an environmental
- 3 specimen containing one or more analytes.
- 4 3. The field portable mass spectrometer system of Claim 2, wherein the aerosol
- 5 interface further comprises a nebulizer for injecting metered amounts of MALDI matrix particles
- 6 into the environmental specimen prior to the inlet collecting the environmental specimen.
- 7 4. The field portable mass spectrometer system of Claim 3, wherein the metered
- 8 amounts of MALDI matrix particles mixed with the one or more analytes contained in the
- 9 environmental specimen form a spatially heterogeneous distribution of analyte and matrix.
- 1 5. The field portable mass spectrometer system of Claim 2, wherein the metered
- 2 amount of matrix solution injected into the environmental specimen is adjusted in accordance
- 3 with differing amounts of environmental background.
- 4 6. The field portable mass spectrometer system of Claim 2, wherein the aerosol
- 5 interface further comprises one or more tape particle collector/impactor stations for collecting,
- 6 concentrating and separating said one or more analytes contained in said environmental sample.
- 7 7. The field portable mass spectrometer system of Claim 1, wherein the sample
- 8 transporter comprises a tape that receives the sample deposits from the sample collector, the tape

3 being received at the sealable opening of the mass spectrometer, thereby allowing a sample
4 thereon to be received in the extraction region of the mass spectrometer.

1 8. The field portable mass spectrometer system of Claim 7, wherein movement of
2 the tape when interfacing with the sample collector is independent of movement of the tape when
3 being received in the mass spectrometer.

1 9. The field portable mass spectrometer system of Claim 7, wherein the sample
2 transporter further comprises a first controllable motor that receives control signals from the
3 control unit and enables independent movement of the tape when interfacing with the sample
4 collector and a second controllable motor that receives control signals from the control unit and
5 enables independent movement of the tape when being received in the mass spectrometer.

1 10. The field portable mass spectrometer system of Claim 7, wherein the independent
2 movement of the tape is provided at least in part by a movable tensioner that interfaces with the
3 tape, the movable tensioner being interposed between the sample collector and the mass
4 spectrometer.

1 11. The field portable mass spectrometer system of Claim 7, wherein the tensioner is
2 a spring-loaded shaft and roller arrangement, the tape being wound around at least a part of the
3 shaft and roller components.

1 12. The field portable mass spectrometer system of Claim 1, wherein the TOF mass
2 spectrometer comprises a linear TOF mass spectrometer.

1 13. The field portable mass spectrometer system of Claim 1, wherein the TOF mass
2 spectrometer comprises a linear and/or reflectron TOF mass spectrometer.

1 14. The field portable mass spectrometer system of Claim 1, wherein the sealable
2 opening and the extraction region of the TOF mass spectrometer are provided in a housing
3 attached to or part of the TOF mass spectrometer.

1 15. The field portable mass spectrometer system of Claim 13, wherein the housing
2 further comprises a roughing vacuum chamber portion that connects between the sealable
3 opening of the housing to a vacuum valve.

1 16. The field portable mass spectrometer system of Claim 13, wherein the housing
2 further comprises a removable cover that is engageable with the sealable opening, the removable
3 cover and the sealable opening forming a vacuum seal when engaged.

1 17. The field portable mass spectrometer system of Claim 14, wherein a roughing
2 pump interfaces with the roughing vacuum chamber portion and serves to evacuate the roughing
3 vacuum chamber portion when (a) the vacuum seal is formed between the removable cover and
4 the sealable opening and (b) the vacuum valve is closed.

1 18. The field portable mass spectrometer system of Claim 14, wherein the vacuum
2 seal is provided by at least one o-ring in each of the removable cover and the sealable opening,
3 the o-rings engaging to form a vacuum seal when the removable cover engages the sealable
4 opening.

1 19. The field portable mass spectrometer system of Claim 15, wherein the cover is a
2 platen.

1 20. The field portable mass spectrometer system of Claim 14, wherein a surface of the
2 cover that covers the sealable opening comprises an electrode and defines one end of an
3 extraction region of the TOF mass spectrometer in the roughing vacuum chamber portion.

1 21. The field portable mass spectrometer system of Claim 16, wherein one or more
2 additional electrodes surrounding the roughing vacuum chamber portion and lying between the
3 sealable opening and the vacuum valve defines another end of the extraction region.

1 22. The field portable mass spectrometer system of Claim 19, wherein a vacuum
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the
3 main mass spectrometer vacuum chamber.

1 23. The field portable mass spectrometer system of Claim 20, wherein the open valve
2 between the mass spectrometer vacuum chamber and the extraction region forms part of the time
3 of flight path of the spectrometer.

1 24. The field portable mass spectrometer system of Claim 20, wherein the vacuum
2 pump that interfaces with the main mass spectrometer vacuum chamber serves to evacuate the

- 3 main mass spectrometer vacuum chamber and the roughing vacuum chamber when the valve is
4 opened, thereby providing a connected vacuum between the main mass spectrometer vacuum
5 chamber and the roughing vacuum chamber when the valve is opened.